Ground Control Station
THE UNIVERSAL CONCEPT

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Silver Arrow
A Subsidiary of Elbit Systems Ltd

Report Documentation Page

Form Approved
OMB No. 0704-0188

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1. REPORT DATE	2. REPORT TYPE	3. DATES COVERED
02 SEP 2003	**N/A**	**-**

4. TITLE AND SUBTITLE	5a. CONTRACT NUMBER
Ground Control Station THE UNIVERSAL CONCEPT	5b. GRANT NUMBER
	5c. PROGRAM ELEMENT NUMBER
6. AUTHOR(S)	5d. PROJECT NUMBER
	5e. TASK NUMBER
	5f. WORK UNIT NUMBER
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) **Elbit Systems-Silver Arrow, Israel**	8. PERFORMING ORGANIZATION REPORT NUMBER
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)	10. SPONSOR/MONITOR'S ACRONYM(S)
	11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION/AVAILABILITY STATEMENT
Approved for public release, distribution unlimited

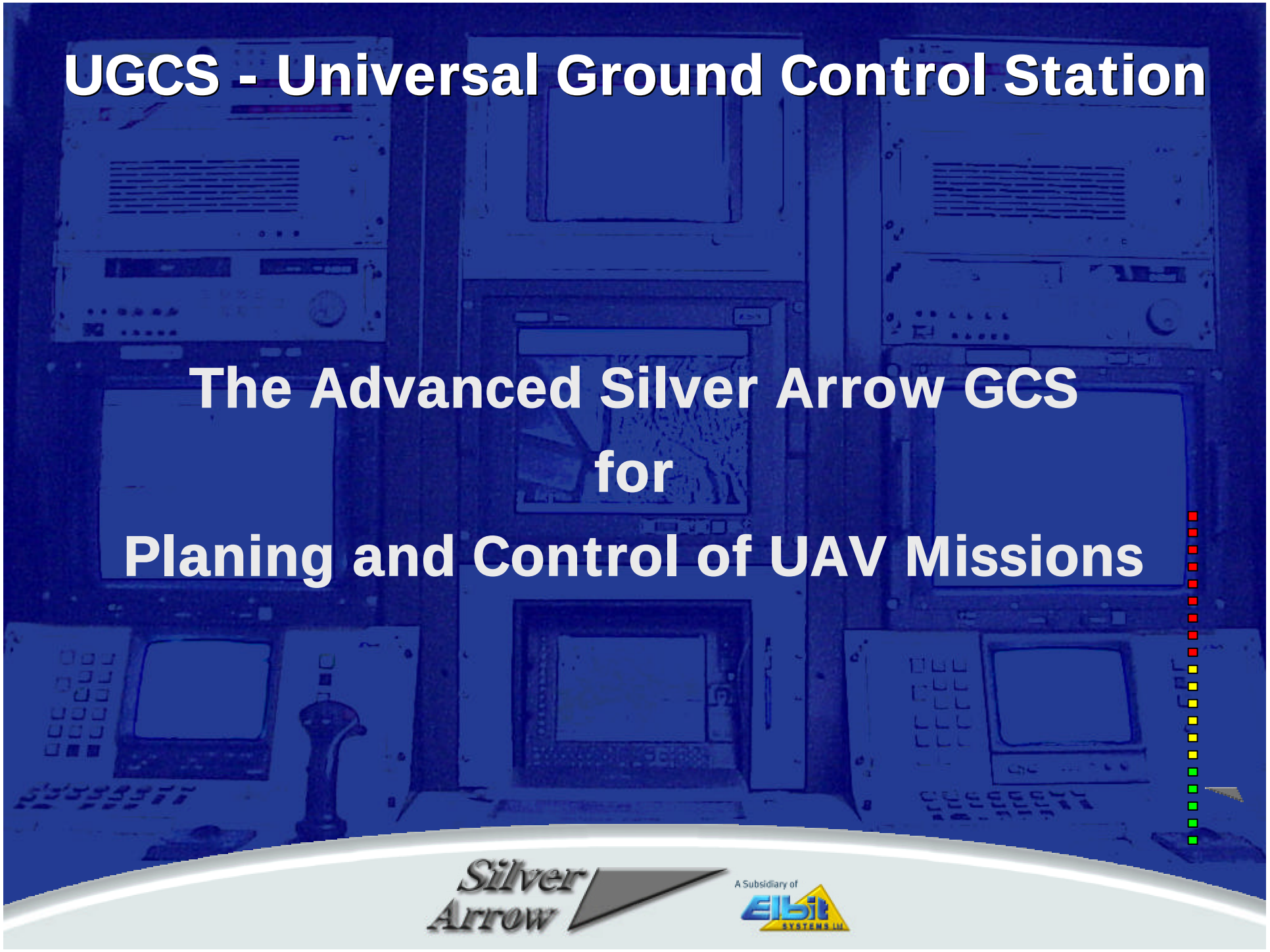
13. SUPPLEMENTARY NOTES
See also ADM001676, UAV 2002 conference & Exhibition., The original document contains color images.

14. ABSTRACT

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			
unclassified	**unclassified**	**unclassified**	**UU**	**19**	

UGCS - Universal Ground Control Station



The Advanced Silver Arrow GCS
for
Planing and Control of UAV Missions

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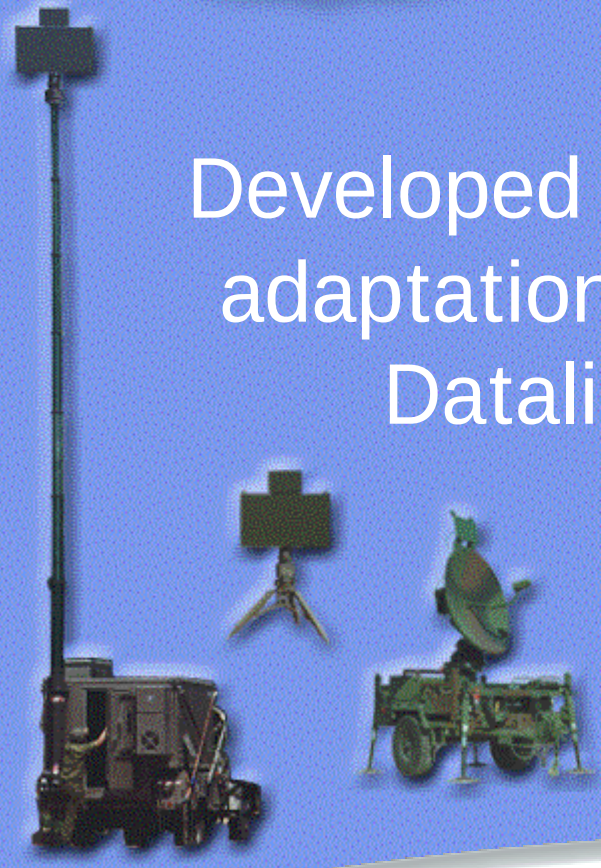
UGCS - Universal Ground Control Station

Developed to support easier and faster adaptation for various types of UAVs, Datalinks, HMI and Payloads



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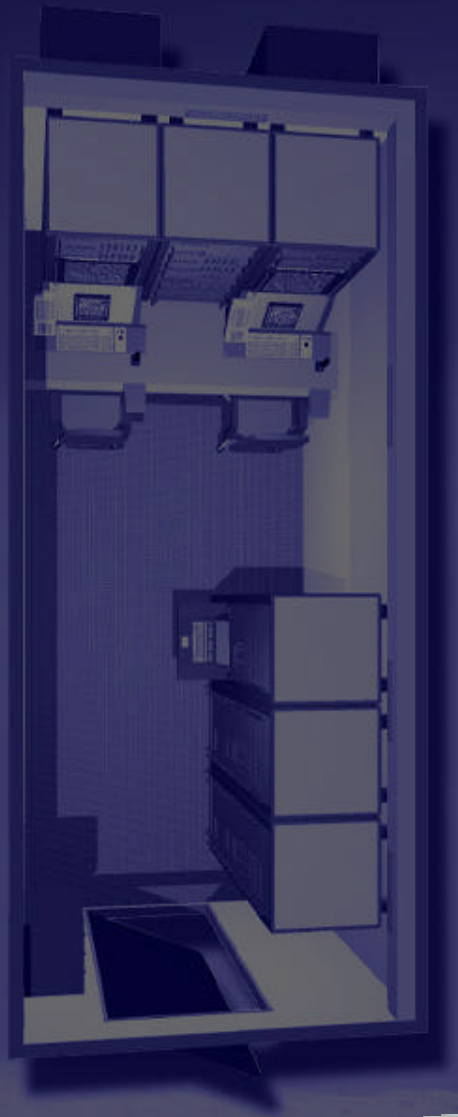
Mission Requirements



- Full functionality to perform two missions in parallel, including relay operations
- ISTAR missions
- SIGINT missions
- Relay missions

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Engineering Approach

- Generic design that shall support easy adaptation to various payloads, data links, human-machine interface and air vehicles
- Identical mission operation consoles
- Flexible modes designation to consoles
- A redundant system design concept ensuring the safety of the A/V and mission accomplishment

Engineering Approach

- Use of main stream technology
- Use of COTS Hardware & Software
- Interoperability by easy adaptation to STANAG 4586
  (Standard Interfaces for UAV Control Systems)
- Scalability of the system from RVT to full scale GCS
- Redundancy and safety emphasis

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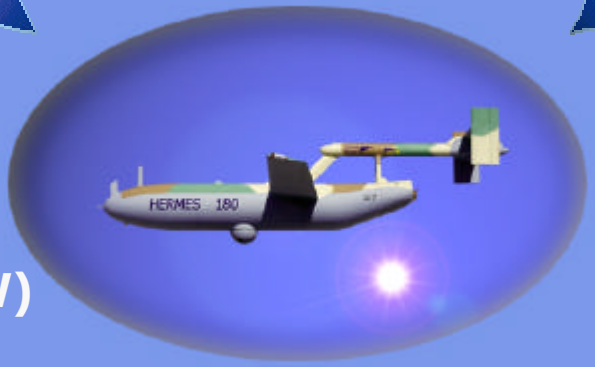
Technologies & Expertise

Composite Structure

System Engineering

System integration & Testing



Avionics (H/W, S/W)

Rotary Engines

Command & Control

Electro Optics

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Human Engineering Approach

- Advanced operation based on the glass-cockpit design concept
- Simple and efficient console design that meets the limitations of tactical highly mobile vehicles

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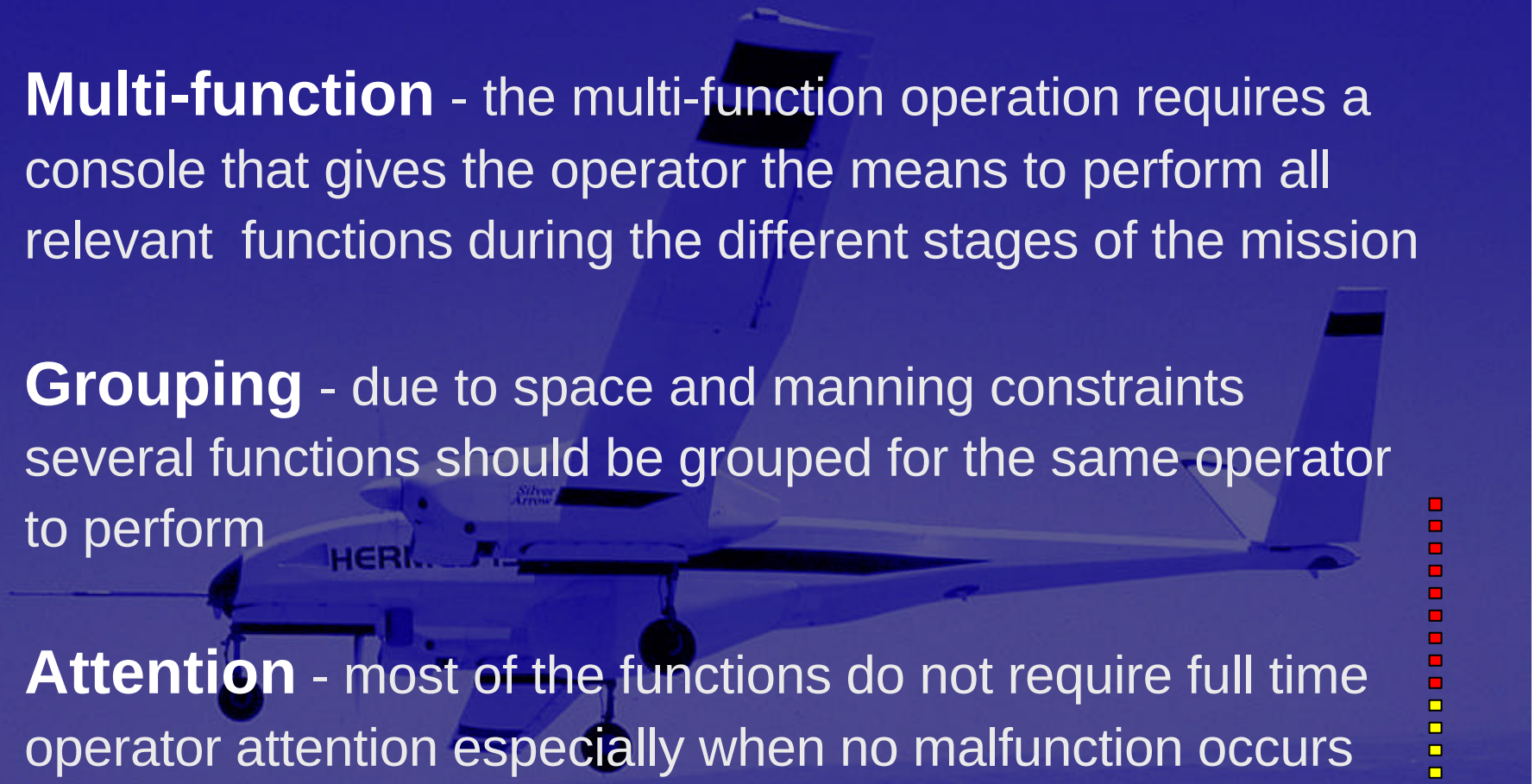
HFE - DESIGN CONCERNS

- **Multi-function** - the multi-function operation requires a console that gives the operator the means to perform all relevant functions during the different stages of the mission
- **Grouping** - due to space and manning constraints several functions should be grouped for the same operator to perform
- **Attention** - most of the functions do not require full time operator attention especially when no malfunction occurs and only monitoring is required



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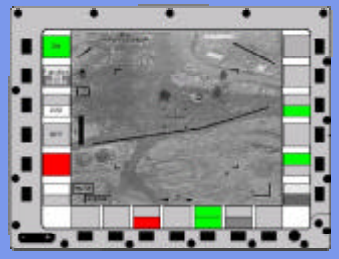
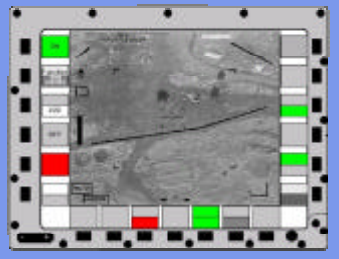
GCS Positions

Mission 1



GCS Commander

Mission 2



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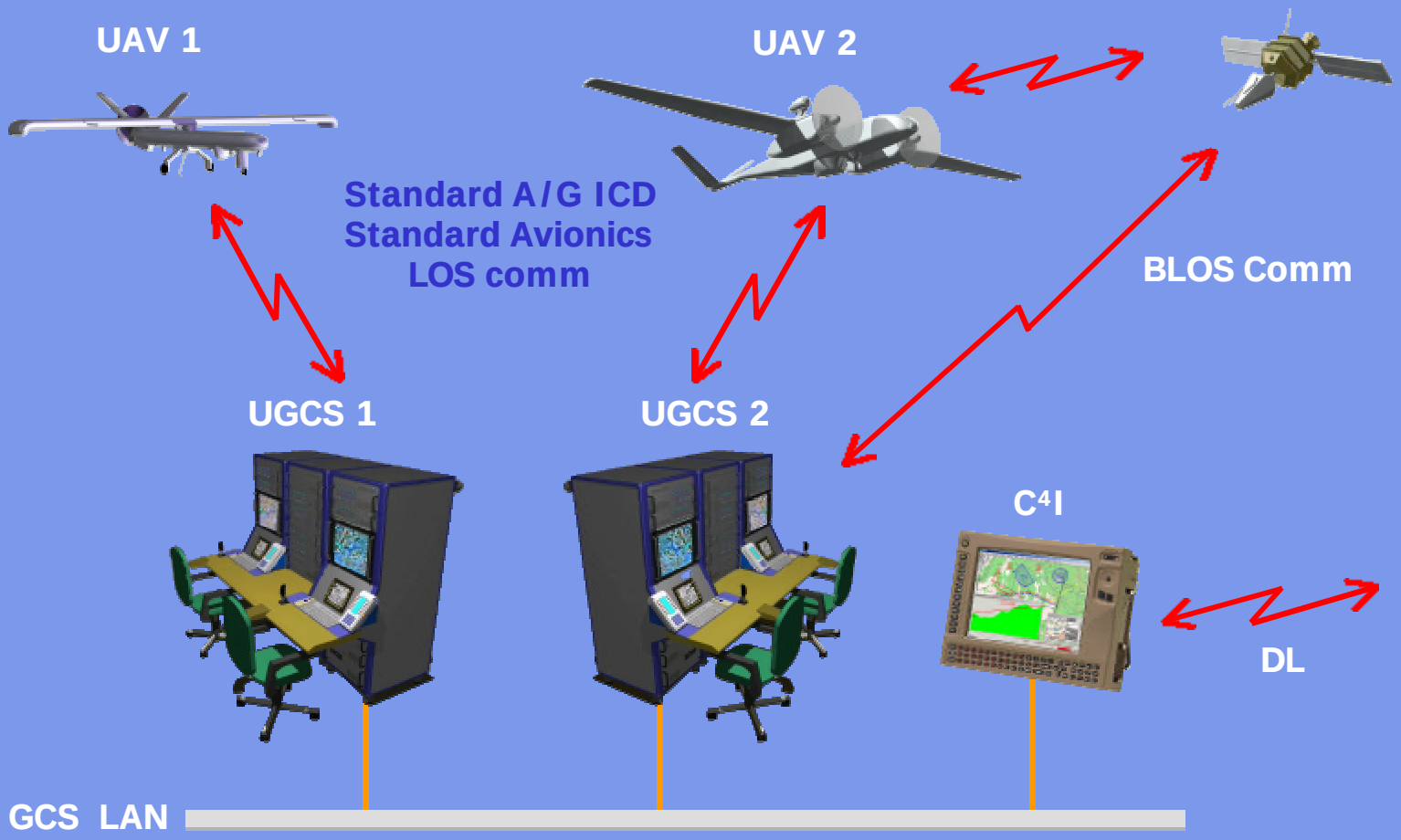
UAV System Concept



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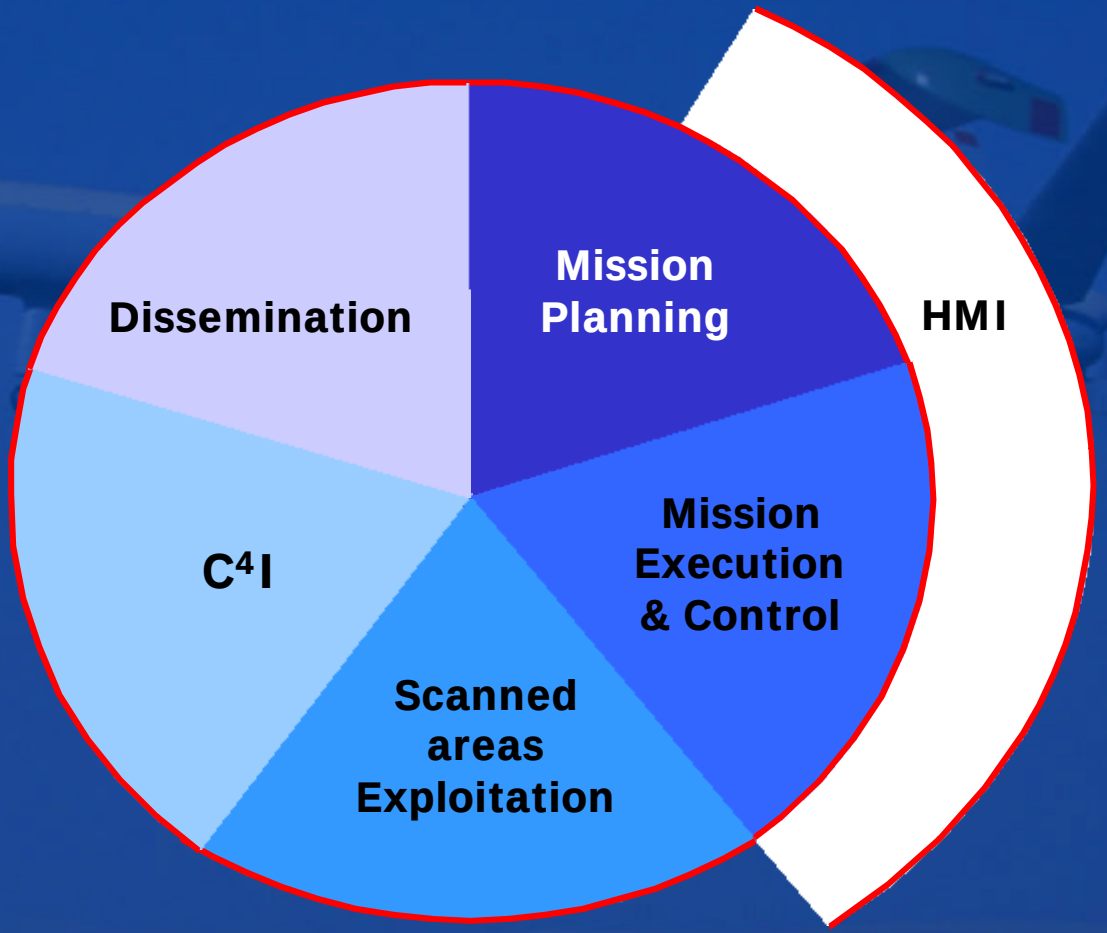
SW Modular Components



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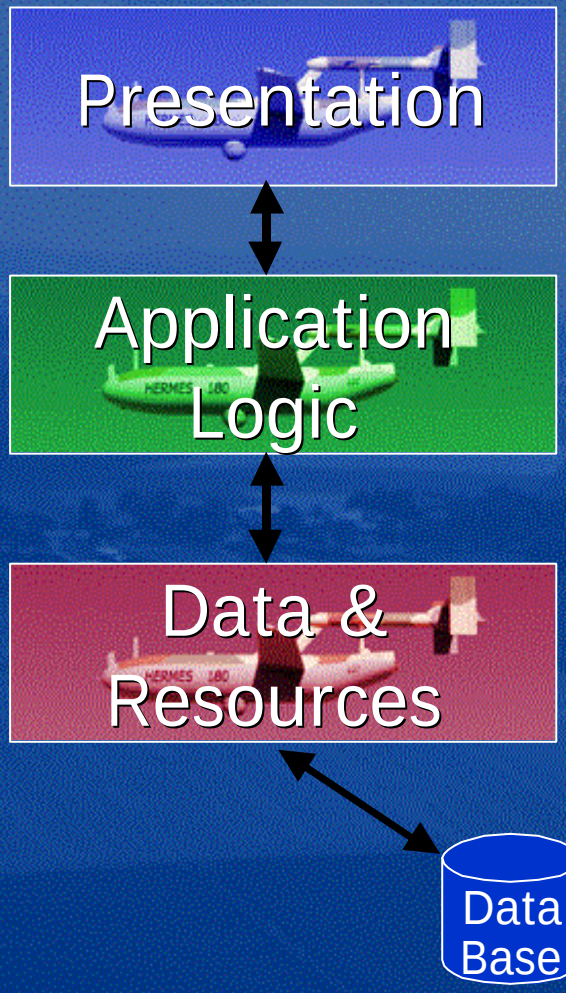
3 TIER MODEL (Cont')



- Manage user interaction and request application server
- Maps,Forms, ,Slides ,UAV Icon

- Perform business logic & make request to DB
- Components Design distributed to classes
- like devices, payloads, UAV,Data elements Etc

- High performance access to data

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Component Based Application

The design of the application components is object-oriented, each object made up of an abstract component and real components

- The abstract component represents the general object (such as a generic UAV)
- the real component represents the real object (such as the Hermes).

Component Based Application

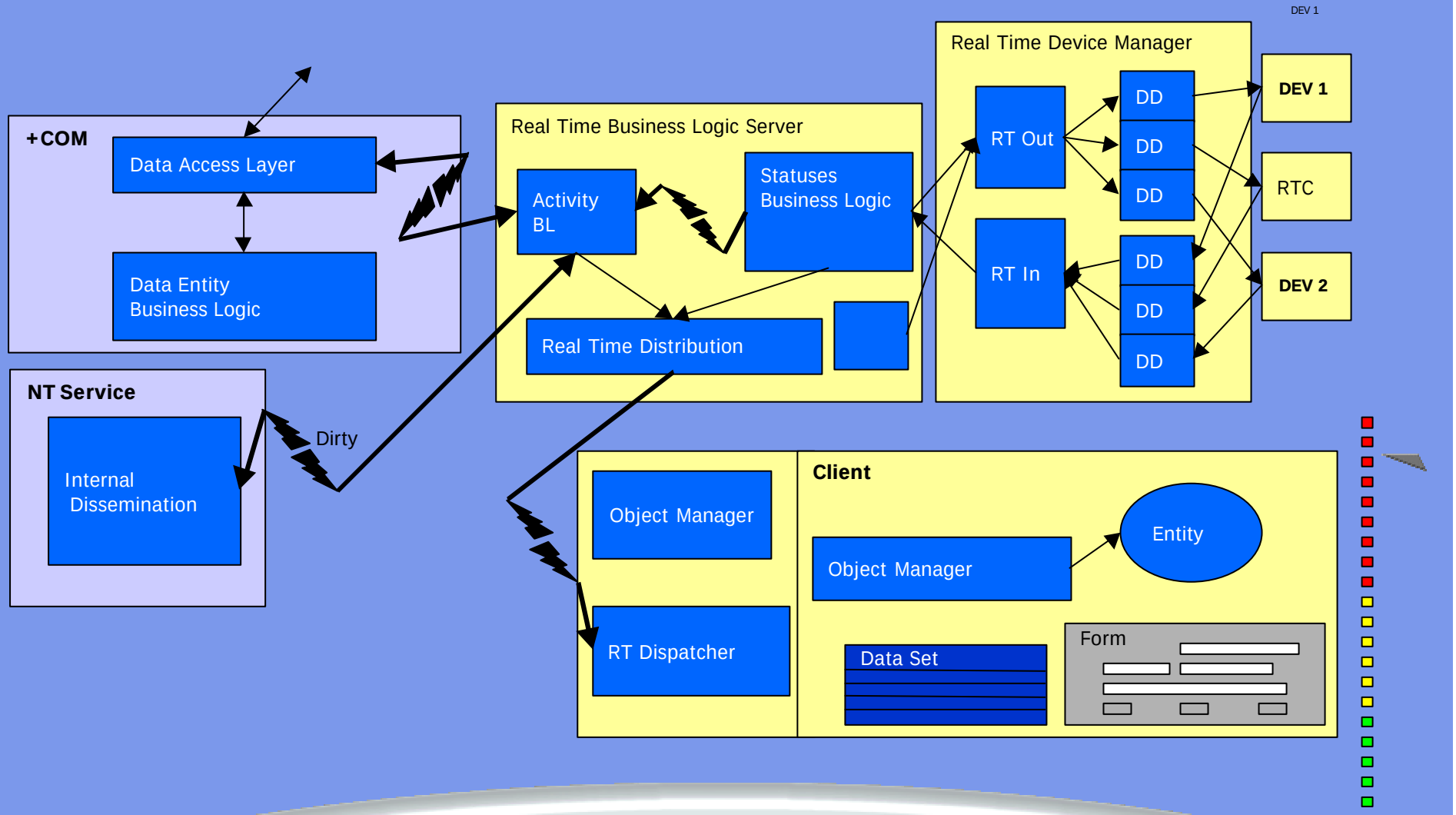
Application components ⇨ Modular application

– Easier to maintain - The impact of changes and upgrades can often be isolated down to an individual application component. This isolation simplifies integration and testing.

– Easier to enhance - New capabilities can be added incrementally without impact on the existing functionality usage.

– Easier to reuse

SW Architecture



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Operating Systems

Real Time

VX Works

Client - Server

OPS

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Fail-Safe Design

The main design principles:

- RTC and RTC backup controlled by a hot-backup mechanism
- Similarity of the operator consoles
- Backup server for the Application Server using a clustering mechanism.
- Backup DB for the DataBase using RAID 1-level mechanism.
- Dual redundant LAN.
- Backup terminal server for the master terminal server using software mechanism in the server for handling the backup.

Safety design

- Detailed analysis of hazards generators (HW & SW) was done
- Special treatment (active and tests) is conducted for each hazard and the route that leads to it.

  Example -

  special CRC is added to uplink messages by the function that generates them. Recheck is preformed before transmission to the air vehicle

- Certification process of the HERMES family UAVs and the UGCS was started.